CLOSURE PLAN FOR
LAND DISPOSAL UNIT CPP-33

CONTAMINATED SOIL IN TANK FARM AREA
NEAR WL-102, NE OF CPP-604

MAY 30, 1991

IDAHO NATIONAL ENGINEERING LABORATORY
DEPARTMENT OF ENERGY
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LIST OF ACRONYMS

ANSI/ASME	American National Standards Institute/American Society of Mechanical Engineers
BGL	Below Ground Level
CEP	Controls for Environmental Pollution, Inc.
cmp	counts per minute
COCA	Consent Order and Compliance Agreement
CSWP	Construction Safe Work Permit
DOE-HQ	U.S. Department of Energy Headquarters in Washington, D.C.
DOE-ID	U.S. Department of Energy, Idaho Operations Office
DOT	U.S. Department of Transportation
DPE	Drilling Project Engineer
EPA	Environmental Protection Agency
FFA/CO	Federal Facilities Agreement/Consent Order
FPR	Fuel Processing Restoration
GAI	Golder Associates Inc.
HEA	Health Environment Assessment
HP	Health Physics Personnel
I.D.	Inside Diameter
ICPP	Idaho Chemical Processing Plant
INEL	Idaho National Engineering Laboratory
LDU	Land Disposal Unit
LPG	Lead Project Geologist
NQA-1	Quality Assurance Program Requirement for Nuclear Facilities
O.D.	Outside Diameter
OVA	Organic Vapor Analyzer
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Program Plan
QASP	Quality Assurance Sampling Plan
RCRA	Resource Conservation and Recovery Act
RDF	Chronic Reference Dose
RPD	Relative Percent Difference
SRPA	Snake River Plain Aquifer
SWMU	Solid Waste Management Unit
TCLP	Toxic Characteristic Leach Procedure
TIC	Tenatively Identified Compounds
USDA	United States Department of Agriculture
UTL	Upper Tolerance Limits
UURI	University of Utah Research Institute
VMF	Vehicle Monitoring Facility
WINCO	Westinghouse Idaho Nuclear Company
RWMC	Radioactive Waste Management Complex

EXECUTIVE SUMMARY

This closure plan is being submitted to comply with the Idaho National Engineering Laboratory (INEL) Consent Order Compliance Agreement (COCA), which requires the submittal of a closure plan for each Land Disposal Unit (LDU). LDU CPP-33 is located near the northeast corner of building CPP-604. Radioactively contaminated soil was discovered at the site during excavation for the new Process Equipment Waste (PEW) evaporator building in (addition to 604) 1974. The contamination was attributed to releases from a corroded 4-foot section of the 12-inch carbon steel pressure relief line, 12 feet below grade, running from the waste tank storage area to the ICPP stack. An additional 3- to 6-foot of the pressure relief line was in lesser stages of corrosion. The contamination diffused vertically in plumes to a depth of approximately 16 feet and horizontally in "fingers" which followed sand-filled lenses to approximately 20 feet. It was estimated that approximately 1,000 to 3,000 curies (Ci) of activity were released into the soil, which resulted in the removal of approximately 250- to 300-yd^3 of soil to the INEL Radioactive Waste Management Complex (RWMC). Some contamination was reportedly left at the site. Wastes associated with LDU CPP-33 are the same as those known or suspected in the vicinity of the Tank Farm. These wastes potentially include acids, 4-methyl-2-pentanone, metals and radionuclides.

Additional contaminated soil was encountered during the summer of 1983, during excavation to replace tank WL-102, which was also located near the northeast corner of building CPP-604. This contamination was also attributed to the releases from the corroded pressure relief line discovered in 1974. Approximately 14,000 cubic yards of soil was excavated for the replacement task. About 2,000 cubic yards of soil exceeded 30 mR/hr and was sent to the RWMC for disposal. The remaining 12,000 cubic yards of soil was moved in August-September 1984 and disposed in a trench (LDU CPP-34) in the northeast corner of the ICPP. After excavation the area was backfilled and a portion of CPP-33 was paved over with an asphalt road.

LDU CPP-33 was characterized in accordance with the INEL COCA. CPP-33 was listed as an LDU because of the potential presence of RCRA hazardous wastes/constituents and radionuclides in the underlying strata resulting from releases from a corroded 4-foot section of a pressure relief line running from the Waste Tank Storage area to the ICPP stack. The unit has been determined from an assessment of contaminated soil incident reports, personal interviews, and ICPP drawings. Based on this assessment the releases from the corroded pipe occurred within the boundary for LDU CPP-33. Although radionuclides are not governed by RCRA, radiological analyses were performed to determine if the radiological contamination present at the unit posed an unacceptable risk to human health, safety or the environment.

Analysis of soil samples from one borehole (113.6 feet deep) located within LDU CPP-33 was conducted to determine the presence of RCRA hazardous wastes/constituents and radionuclides. In addition, a lysimeter and monitoring well, installed at LDU CPP-33, will provide water samples allowing surveillance of dissolved constituents. This surveillance is part of an overall hydrogeologic characterization of the Tank Farm area. To

date, five monitoring wells and five lysimeters have been installed as part of the program. Validated soil sample analysis results are included in this closure plan. Three inorganic hazardous constituents (cadmium, lead, and mercury) were detected above background Upper Threshold Limits (UTL). Cadmium was detected in five samples, lead in three, and mercury in all but three samples. Although analytical results show that cadmium, lead, and mercury were detected above the UTL none were found exceeding the maximum allowable soil concentrations based on the Chronic Reference Dose (RfD) (EPA, 1990b). Organic analysis identified trichloroethene in one sample, below the contract required quantitation limit for soils. No other organic contaminants were encountered.

Sample analysis results have also detected numerous radioactive contaminants, including cesium-137, neptunium-237, strontium-90, uranium-234, and uranium-238.

A Health and Environmental Assessment has been performed for the hazardous constituents detected at CPP-33. The hazardous constituents detected (cadmium, lead, mercury, trichloroethene) however, are not in concentrations that pose an unacceptable risk to human health, safety, or the environment. The presence of radionuclides will be evaluated under the upcoming Federal Facilities Agreement/Compliance Order (FFA/CO). With respect to radioactive contamination, applicable DOE Orders will be addressed and incorporated as needed.

Since RCRA hazardous wastes/constituents were detected at levels below those that would pose a threat to human health, safety or the environment, no remediation or post-closure should be required. Therefore, clean closure is recommended and no further action is required.

1.0 FACILITY CONDITIONS

1.1 Idaho Chemical Processing Plant

The Idaho Chemical Processing Plant (ICPP) is a facility at the Idaho National Engineering Laboratory (INEL), located within a fenced security area of more than 200 acres. The primary mission of the ICPP, which began operations in 1953, has been for reprocessing of nuclear fuel, recovery of uranium and krypton, and management of the generated waste. The location at the INEL of the ICPP is shown on Figure 1-1.

1.2 General Description

Land Disposal Unit (LDU) CPP-33 is located near the northeast corner of building CPP-604 as shown on Figure 1-2. A more detailed view of the unit is shown in Figure 1-3. Radioactive contaminated soil was discovered at the site during excavation for the new Process Equipment Waste (PEW) evaporator building in 1974. The contamination was attributed to releases from a corroded 4-foot section of the 12-inch carbon steel pressure relief line running from the waste tank storage area to the ICPP stack. An additional 3 to 6 feet of the pressure relief line was in lesser stages of corrosion. The top of the corroded line and the area of high level contaminated soil were reached at a depth of approximately 12 feet below grade. The contamination appears to have diffused vertically in plumes to a depth of approximately 16 feet and horizontally in "fingers", which followed sand-fill lenses to approximately 20 feet. Several fingers of contaminated soil which followed sand "lenses" were discovered. Typically these fingers were a few inches to a foot in thickness and traveled several feet. Two of the largest of these fingers resulted in significant activity as much as 10-15 feet from the main column of contaminated soil and temporarily raised the question of the possibility of multiple sources. Since (1) further excavation better delineated the extent and pattern, (2) no other leaking pipes or sources were found, and (3) the contamination composition was consistent with the main body of the source, it was concluded that the one leaking pipe was the only source.

It is estimated that approximately 1,000 to 3,000 curies (Ci) of activity were released into the soil, which resulted in excavation of approximately 250 to 300 cubic yards of soil to the INEL Radioactive Waste Management Complex (RWMC). However, some contamination was reportedly left at the site (WINCO, 1974).

The approximate location of the 1974 and 1983 excavations (discussed below) are shown in Figure 1-3. A photograph of the 1974 excavation is shown in Figure 1-4 which, when viewed along with Figure 1-5, provides:

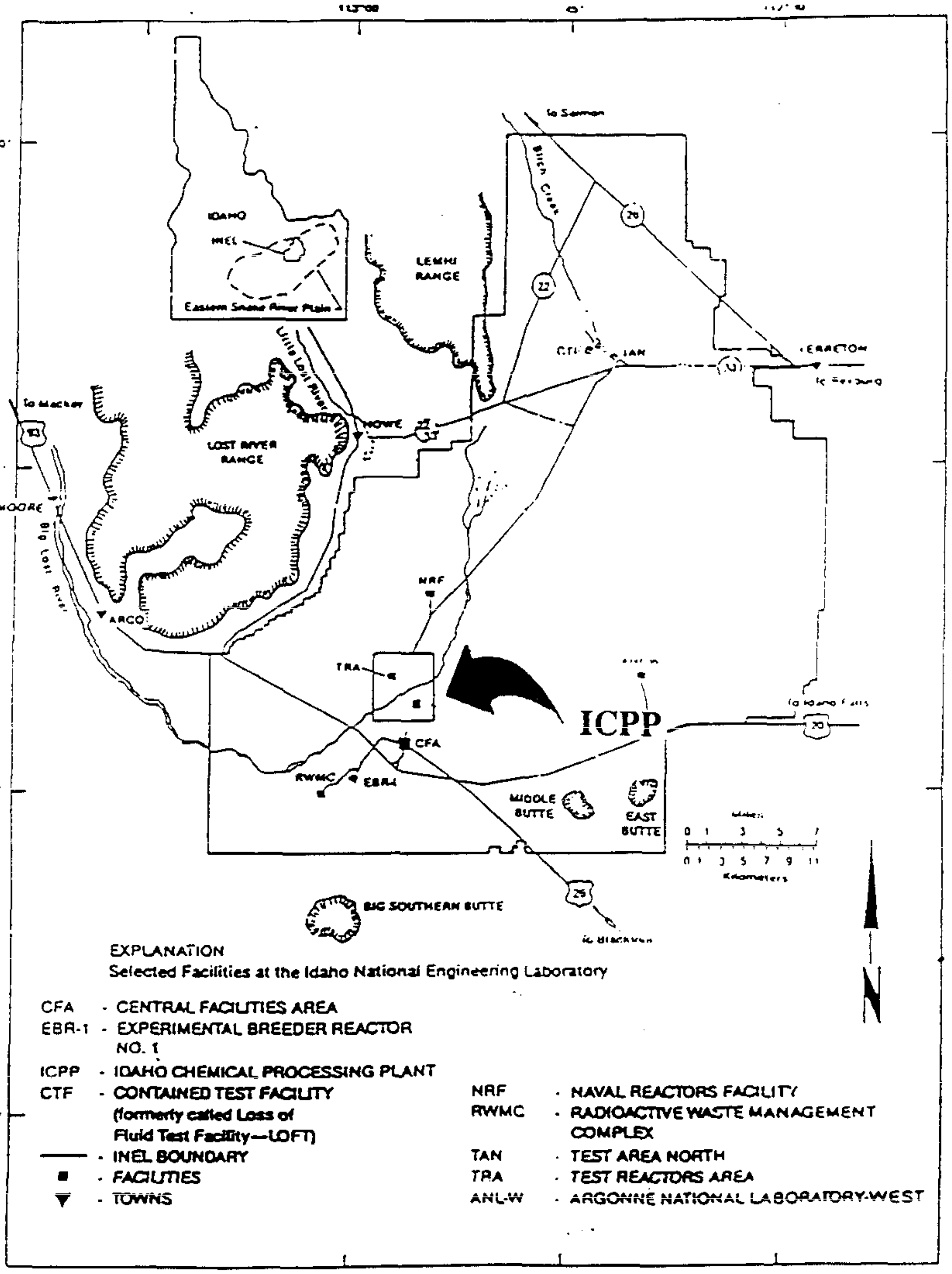
- A sense of the size and depth of the pit,
- A photograph of excavated facilities after most of the hot soil had been removed, and
- A sketch of excavated facilities along with the level of radioactivity measured in the surrounding soil.

Additional contaminated soil was encountered during the summer of 1983, when work was conducted to replace tank WL-102, which was also located near the northeast corner of building CPP-604. This contamination was also attributed to the releases from the corroded pressure relief line discovered in 1974. Approximately 14,000 cubic yards of soil was excavated from CPP-33. About 2,000 cubic yards of soil exceeded 30 mR/hr and was sent to the RWMC for disposal. The remaining 12,000 cubic yards of soil was moved in August to September 1984 and was disposed in a trench (LDU CPP-34) in the northeast corner of the ICPP. After excavation, the area of CPP-33 was backfilled, and a portion of it was paved over with an asphalt road. However, trace amounts of radioactively contaminated soils were reportedly left at the site below and outside the excavated area (Ikenberry, 1984). During recent drilling activities to characterize this Land Disposal Unit (LDU), buried objects were encountered at depths of 33, 13, and 29 feet below ground level (BGL). Workmen in the area reported the bore holes were located in line with a column of I-beams (possibly similar to those identified in Figure 1-4 as "New Piling") which had been cut off beneath the surface. Apparently soils in the vicinity of LDU CPP-33 had been excavated to depths of at least 33 feet, possibly down to the basalt.

In summary, the unit has been determined from an assessment of contaminated soil incident reports, personal interviews, and ICPP drawings. Based on this assessment the releases from the corroded pipe occurred within the boundary for LDU CPP-33 noted on Figures 1-3 and 6-1. these releases occurred from the pressure relief line, located 12 feet below grade. The contamination diffused vertically in plumes to a depth of approximately 16 feet and horizontally in "fingers" which followed sand-fill lenses to approximately 20 feet.

1.3 Unit Characterization Objectives

LDU CPP-33 was characterized in accordance with the INEL Consent Order and Compliance Agreement (COCA). CPP-33 was listed as an LDU because of the potential presence of Resource Conservation and Recovery Act (RCRA) hazardous wastes/constituents and radionuclides from approximately 12 to 28 feet below grade, that resulted from releases from a corroded 4-foot section of a pressure relief line running from the Waste Tank Storage area to the ICPP stack. Although radionuclides are not governed by RCRA, radiological analyses were performed to determine if the radiological contamination present at the unit posed a risk to human health, safety or to the environment. The primary objectives for the characterization of LDU CPP-33 were to 1) determine the nature and vertical extent of contamination due to the release of RCRA hazardous and radiological



Note: LDU CPP-33 is located at the ICPP

FIGURE **1-1**

GENERAL INEL SITE MAP

EG&G/ICPP-33/ID

(after Bartholomay, et al, 1989)

PROJECT NO. 893-1195.850 DWG. NO. 23025 DATE 1/28/91 DRAWN DC

Golder Associates

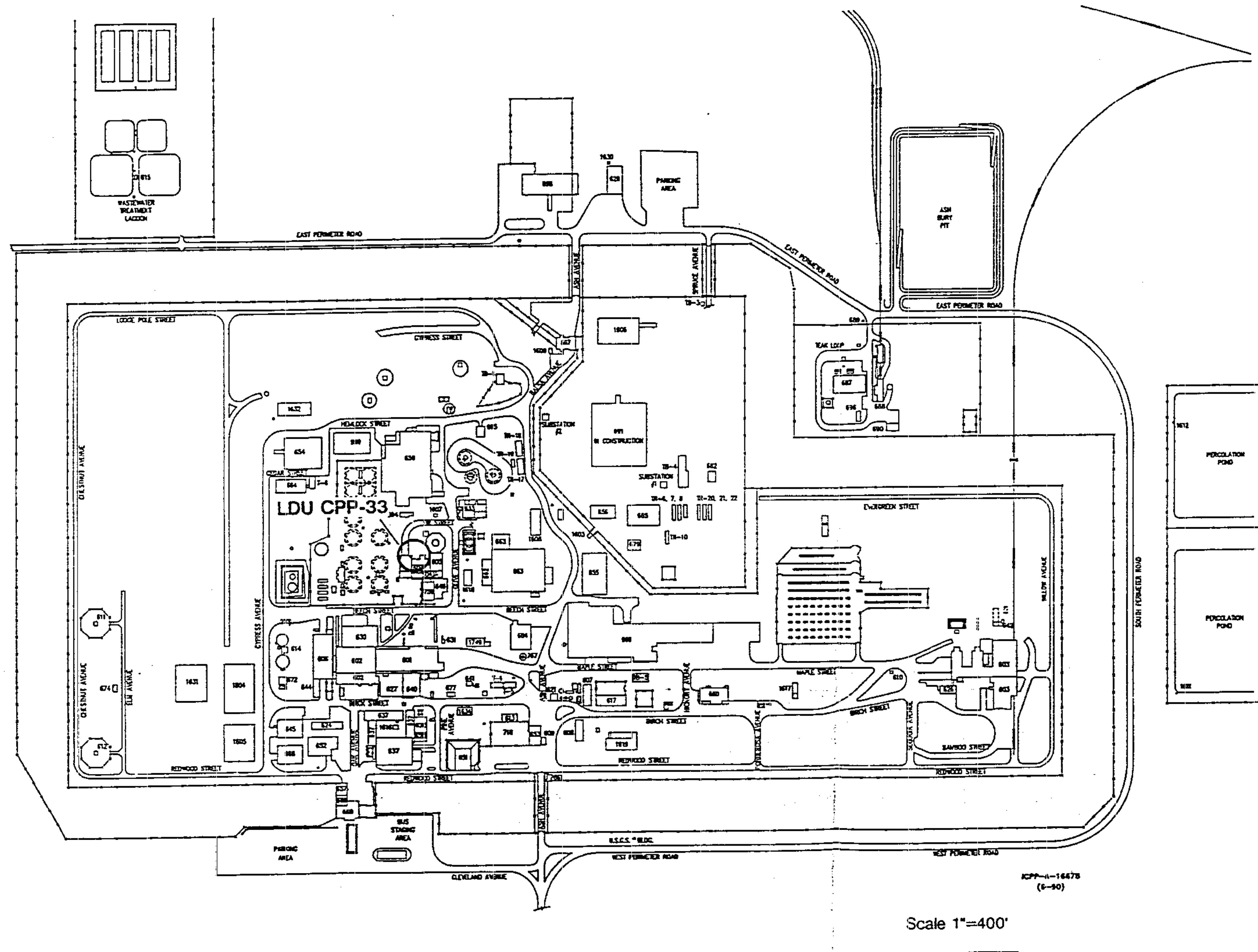


FIGURE 1-2
ICPP SITE PLAN
EG&G/ICPP-33/ID

Golder Associates

PROJECT NO 893-1195.850 DWG NO 23658 DATE 4/1/91 DRAWN TK

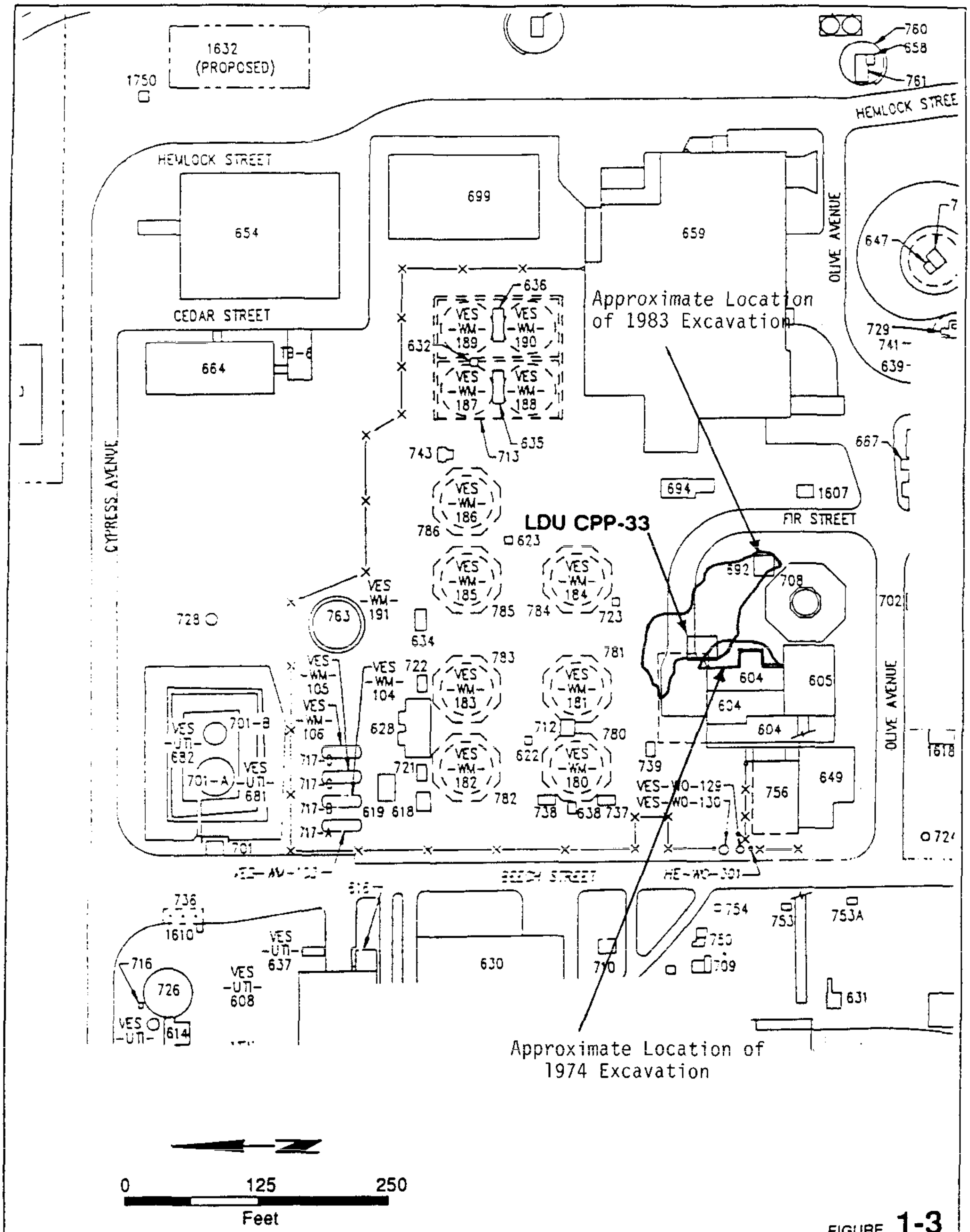


FIGURE **1-3**
LOCATION OF LDU CPP-33
EG&G/ICPP-33/ID

PROJECT NO. 893-1195.850 DRAWING NO. 24812 DATE 4/3/91 DRAWN BY TK

Golder Associates

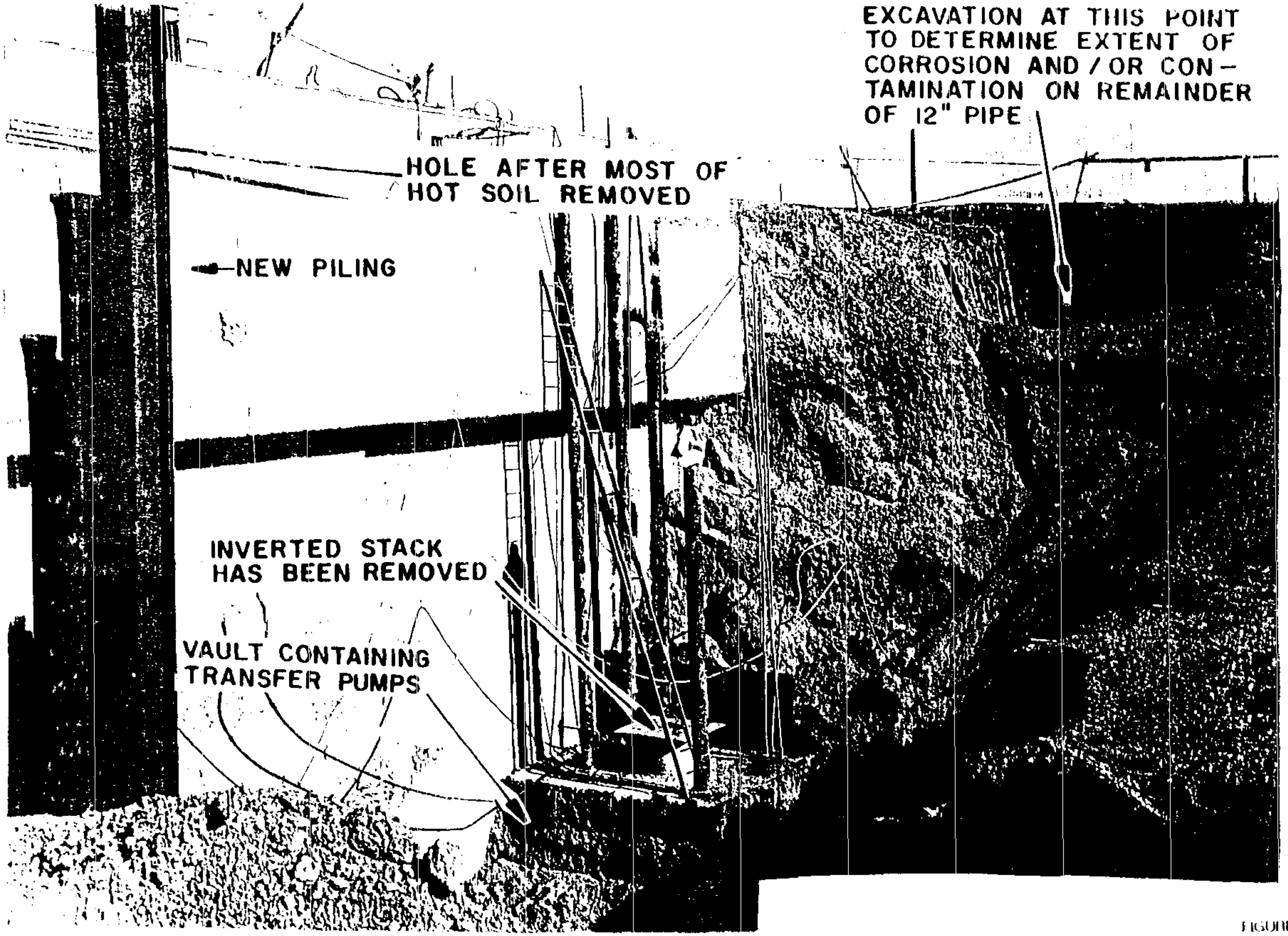


FIGURE 1-4

PHOTOGRAPH OF 1974 EXCAVATION AT LDU CPP-33

EG&G/ICPP-33/ID

PROJECT NO. 853 1150 850 DWG NO. 23667 DATE 4/24/91 DRAWN HP

Golder Associates

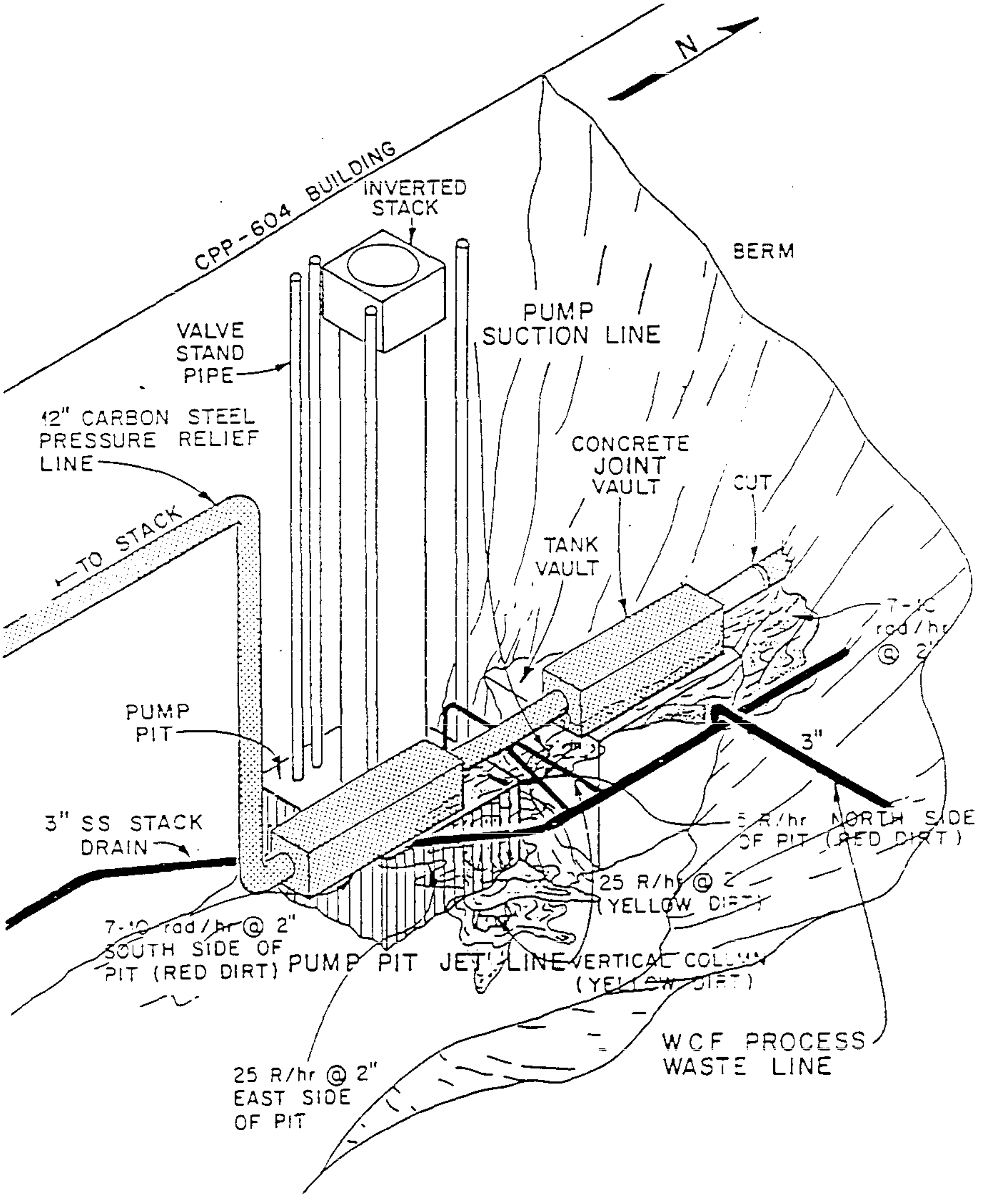


FIGURE 1-5

DIAGRAM OF LDU CPP-33 RELEASE

EG&G/ICPP-33/ID

PROJECT NO 893-1195.850 DWG NO 23668 DATE 4/24/91 DRAWN HP

Golder Associates

wastes/constituents into the soil column and 2) determine if the contamination present poses an unacceptable risk to human health and safety or the environment. Since the area of concern had been previously excavated, the possibility of encountering contamination was considered minimal. In addition, the physical constraints associated with this area (i.e., numerous under underground utilities, obstacles, steep embankments), limited the placement of boreholes. The primary reason for limiting drilling was to prevent rupturing existing lines and allowing the potential exposure and release of high level waste. Therefore, boreholes were initially scheduled to meet these objectives. The first borehole would be used for analytical testing of the soils and the second for placement of a lysimeter for long term monitoring. In order to maximize characterization efforts, the first borehole was also to be converted into a monitoring well. The monitoring well and lysimeter are each one of five monitoring wells and lysimeters which shall be used for overall characterization of hydrogeologic conditions of the entire tank farm area. To date all monitoring wells and lysimeters have been installed as part of the separate hydrogeologic characterization.

1.4 Closure Determinations

Unit closure will be based on the presence of hazardous waste as defined by RCRA or concentration of hazardous constituents and the level of risk posed to human health and safety and/or the environment. If hazardous wastes are not detected or hazardous constituents are present in quantities that do not pose an unacceptable risk to human health and safety or the environment, a proposal will be submitted to the Environmental Protection Agency (EPA) and the State of Idaho requesting clean closure. Soil will not be removed.

If the contaminant concentrations analyzed for pose an unacceptable risk to human health and safety or the environment, all contaminated soil that exceed the regulatory or risk-based levels will be excavated and disposed of according to the applicable regulations. The unit would be clean closed and soil removed in accordance with the requirements of 40 CFR 265, Subpart G (Closure and Post-Closure).

Because of the corrosivity, heavy metal content, and organics of the waste stream associated with the Tank Farm, the action level requiring RCRA closure of LDU CPP-33 will be based on the pH of the soils and/or the presence of metals and organic compounds above Toxicity Characteristic Leach Procedure (TCLP) limits. The action level associated with pH is less than or equal to 2 or greater than or equal to 12.5. Additional action levels for other hazardous constituents such as 4-methyl-2-pentanone (MIBK) will be based on an unacceptable risk to human health and safety. Although radionuclides are not governed by RCRA, radiological analyses, and a health and environmental assessment will be performed to determine if the radiological contamination present at the unit pose a risk to human health, safety, or the environment. If such a radiological risk is identified, the unit will be evaluated under the INEL Federal Facilities Agreement Consent Order (FFA/CO) to determine if remediation or monitoring activities are required.

1.5 Closure Goals

The closure goal for CPP-33 will be to clean close. This decision will be dependent on sampling results. If results of sampling indicate levels above regulatory limits, a significant health and safety impact or an unacceptable environmental hazard, excavation and removal or decontamination may be required. Therefore, if required, the goal will be to clean close the site by decontaminating and/or removing all facility equipment and contaminated soils.

2.0 GEOLOGY

2.1 General Geology

The ICPP is located on alluvial materials deposited by the Big Lost River. Surficial sediments at the ICPP can be divided into two distinct layers. The surface layer to a depth of 35 to 40 feet is a gravel to gravelly sand that averages about 60 percent gravel and 40 percent sand. This coarse surface layer is underlain in many places with a layer (0 to 10 feet) of finer grained materials composed of clayey sands and sand-clay mixtures that directly overlie the basalt. The fine grained layer has an average sand content of 33 percent and an average silt-plus-clay content of 64 percent. The interface between surficial sediments and underlying basalt generally occurs at a depth of 40 to 50 feet below the original land surface (WINCO, 1989a and WINCO, 1989b).

Underlying the surficial sediments are 2000 to 3000 feet of basalt flows with interbedded sedimentary materials. One of the most important of these sedimentary interbeds is a clayey layer that locally occurs at a depth of about 110 feet below ground level (BGL) and, although variable in thickness, may be 15 to 30 feet thick. The interbed commonly consists of moderate reddish to yellowish brown, damp, non-stratified, stiff to hard, silty clay to clayey silt (GAI, 1991c). This interbed is continuous over a large area of the INEL and may be expected to be locally continuous under the ICPP (Hull, 1988).

The sequence of interbedded basalt and sediments continues to well below the water table. There is some evidence of a sedimentary bed at a depth of 750 feet below land surface, which may be the effective bottom of the Snake River Plain Aquifer (SRPA) below the ICPP (WINCO, 1989a and WINCO, 1989b).

Fractures in the basalts commonly have silt and clay filling material where the basalt has been exposed on the surface. There are also volcaniclastic layers within the basalts that are composed primarily of sand- and gravel-sized material. Sedimentary interbeds are likely to be composed of sand- silt- and clay-sized materials (WINCO, 1989a and WINCO, 1989b).

2.2 Site-Specific Geology

As described in section 1.2, approximately 14,000 cubic yards of soil were excavated from the site, resulting in a pit that extended down to a depth of at least 33 feet BGL. Based on the color, aggregate composition and size range of the particles, anthropogenic fill at LDU CPP-33 is probably derived from nearby sources and is therefore similar in composition to undisturbed alluvium, found elsewhere in the vicinity of the site.

Based upon visual observation of core samples taken at CPP-33-1, the following is a description of the lithology beneath the site. The lithologic log for this borehole is included in Appendix A. Shallow (0 to 20 feet BGL) soil samples from the test boring on site consist of very loose to compact, unstratified, fine to coarse sand and fine to medium gravel with trace (< 5 percent) to little (5-12 percent) silt and localized zones of some (12-30 percent) silt. With depth, the sand content was seen to increase, comprising greater than 50 percent of the alluvium, while the coarser fraction (i.e., gravel) generally varied from 12 to 30 percent. The soils overlying the alluvium-basalt contact (which occurred at 48.2 feet BGL) were moist, dense sand, some silt (12 to 30 percent), with trace clay (0 to 5 percent).

Pore water content was described as moist (i.e., adequate moisture content to moisten the hand) throughout the alluvial material with exceptions noted above 6 feet and at 16 feet BGL (see Appendix A). Above 6 feet, the soils were damp (i.e., enough moisture present to darken the appearance, but no moisture or materials adhere to the hand), and at 16 to 18 feet the soils were wet (i.e., visible water present).

The basalt under LDU CPP-33 is a fresh, medium dark gray to dark gray, vesicular, aphanitic, medium strong rock with scattered fractures and localized more fractured (rubble) zones (see Appendix A). Fracture surfaces were commonly found to have thin (1 mm or less), yellowish brown, clayey linings, which have a significant capacity for ion exchange and adsorption. These clayey linings were commonly the sites of significant concentrations of radionuclides, as indicated by the data seen in Tables 6-4 and 6-5. Table 6-4 presents the results of field radiological surveys (conducted with hand-held beta-gamma detection equipment) upon fracture lining material. The radionuclide sample results are included in Table 6-5.

In general, the basalt was damp to moist. No standing water was observed to have collected at the bottom of the borehole during the drilling process, which extended over a 22-day period. Apparently the basalts underlying LDU CPP-33, at this time, are not in hydraulic connection with the perched waters seen elsewhere in the vicinity of the ICPP.

The first sedimentary interbed in the basalt is at 108.5 feet below the surface. Drilling was terminated at 113.6 feet below surface in the interbed (GAI, 1991a, 1991b). Drilling was terminated at this depth for two reasons; 1) To improve the geological/stratigraphical understanding of the ICPP site, and 2) To assure penetration of the stratigraphically equivalent zone associated with perched water in the Tank Farm area. The interbed consists of stiff moderate reddish brown, unstratified, silty clay underlain by stiff, moderate yellowish brown, unstratified clay. The thickness of the interbed below LDU CPP-33 is unknown.

3.0 HYDROLOGY

3.1 Surface Water

The Big Lost River is the major surface water feature on the INEL with its headwaters located west of the site. The Big Lost River flows to the southeast past the town of Arco, Idaho, onto the Snake River Plain, then turns to the northeast, flowing onto the INEL and terminating in three playa lakes. As the river flows onto the plain, the channel branches into many distributaries, and the flow is spread broadly, losing water by infiltration into the channel bottom (Pittman, 1988). The Big Lost River is ephemeral and flows onto the site only during periods of high runoff. The last time flow reached the area of the ICPP was in 1987. The INEL Diversion Dam, constructed in 1984, is located approximately 9 miles upstream from the ICPP (Figure 3-1). It was designed to control flooding on the INEL site by diverting water into designated spreading areas.

Surface water at CPP-33 typically occurs during precipitation events. Water flows from roof drains on surrounding buildings onto the LDU. Due to the low average annual precipitation rate of 9.07 inches and the coarse nature of the soils, surface water typically dissipates through infiltration into the soil column rather than through runoff.

3.2 Groundwater

The depth to the water table of the Snake River Plain Aquifer (SRPA) at the ICPP is approximately 450 feet below land surface, based on 1990 water level measurements (Golder Associates Inc., 1990d) The direction and rate of groundwater movement in the vicinity of the ICPP are well documented from monitoring contaminant plumes in the Snake River Plain Aquifer. The direction of flow in the vicinity of the ICPP is generally from north-northeast to south-southwest. The rate of flow ranges from 5 to 15 ft/day (WINCO, 1989a and WINCO, 1989b).

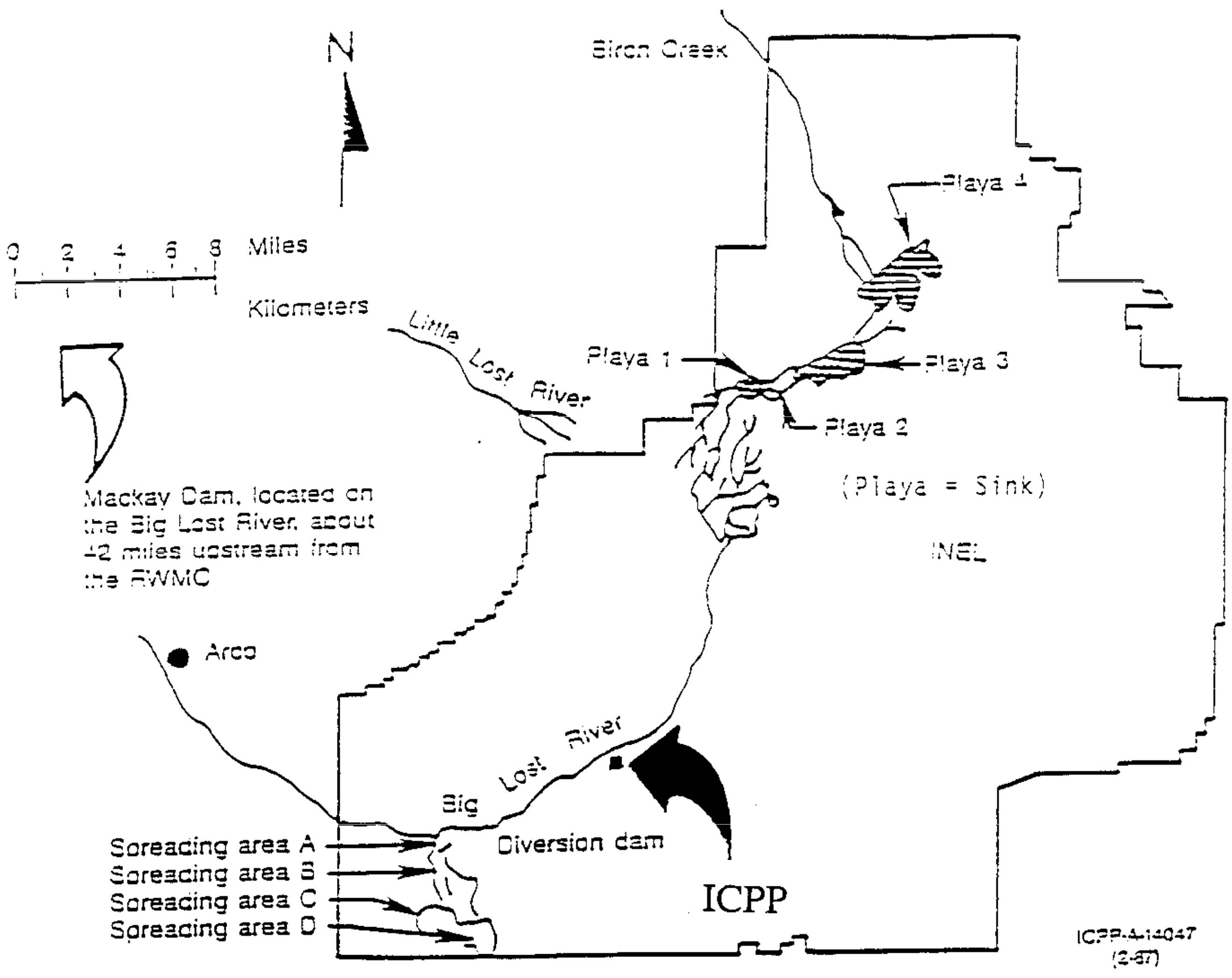


Figure 3-1 Surface water features at or near the INEL (Robertson, et al., 1974)

Perched groundwater zones are known to exist below the ICPP. One perched zone, described by Hull, 1988, is located at an approximate depth of 40 feet at the contact between the surficial alluvial sediments and the uppermost Snake River Plain basalt flow. The groundwater is locally perched by a silty/clayey layer overlying the basalt. Recent drilling in the Tank Farm area has not encountered groundwater perched at this interface.

A second zone is located along the top of a low-permeability sedimentary interbed located at approximately 110 feet BGL. This perched zone does not appear to be laterally continuous under the ICPP. Although previous drilling at the ICPP has encountered this perched zone, several boreholes in the vicinity of the tank farm gave no indication that this perched water was intercepted.

Preliminary results from drilling activities in the Tank Farm area have also identified several perched zones that have developed within vesicular zones overlying the relatively impermeable massive basalt. These perched groundwater zones occur irregularly within the Snake River Plain basalts. In general, the interconnection, direction of flow, and extent of these perched zones is not currently known. The final report describing this interpretation is currently being prepared.

4.0 METEOROLOGY

4.1 Temperature

Average monthly maximum temperatures at the INEL range from 87°F in July to 28°F in January. Average monthly minimum temperatures range from 49°F in July to 4°F in January. The warmest temperature recorded was 101°F, and the coldest temperature through January 1982 has been -40°F (Clausen, Ricks, Start, 1989).

4.2 Wind

The average wind speed at the INEL is about 5 miles/hr in December and maximum of 9 miles/hr in April and May. The highest maximum hourly average speed was 51 miles/hr, measured at the 20-foot level at the Central Facilities Area (CFA) from the west-southwest. Peak gusts of 78 and 87 miles/hr have been observed. Calm conditions prevail 11 percent of the time (Clausen, Ricks, Start, 1989).

4.3 Precipitation

The average annual precipitation at the INEL is 9.07 inches of water. The yearly totals range from 4.50 to 14.40 inches. Individual months have had as little as no precipitation to as much as 4.42 inches. Maximum observed 24-hour precipitation amounts are less than 2.0 inches, and maximum 1-hour amounts are just over 1.0 inch (Clausen, Ricks, Start, 1989).

About 26.0 inches of snow fall each year. The maximum yearly total was 40.9 inches, and the smallest total was 11.3 inches. The greatest 24-hour total snowfall was 8.6 inches. The greatest snow depth observed on the ground was 27 inches (Clausen, Ricks, Start, 1988). January and February average about 7.0 inches for a monthly maximum snow depth on the ground. The ground is usually free of snow from mid-April to mid-November.

4.4 Evaporation

While extensive evaporation data has not been collected on the INEL, evaporation information is available from the towns of Aberdeen and Kimberly, both located on the Snake River Plain in southeastern Idaho, and which have climatic conditions similar to the INEL. The data from these areas is representative of the INEL region and indicates that the average annual evaporation rate is about 42 inches. Recent data from Rexburg, Idaho, located approximately 75 miles east northeast of the ICPP indicates a similar evaporation rate. About 80 percent of the evaporation, 29 in/yr, occurs from May through October (Clausen, Ricks, Start, 1988).

4.5 Summary

The above information is provided as a general overview of the climatic conditions at the ICPP. Relatively small volumes of moisture are available for transport of hazardous or radioactive constituents to the underlying soils and/or aquifers (Thomas, 1988, estimates an average annual recharge rate equal to 0.5 in/yr). Thus, there would be weak hydraulic driving conditions to force the migration of contamination in the subsurface.

5.0 KNOWN OR SUSPECTED WASTE TYPES

5.1 Chemical-Hazardous Waste

Wastes associated with LDU CPP-33 are the same as those known or suspected in the vicinity of the ICPP Tank Farm. Wastes stored in the ICPP Tank Farm are generated from reprocessing spent fuel to recover enriched uranium. These wastes potentially include acids, 4-methyl-2-pentanone, metals, and radionuclides (WINCO 1989c). Table 5-1 includes a list of potential waste constituents associated with the ICPP Tank Farm and LDU CPP-33. This list is based on process knowledge.

5.2 Radioactivity

As noted previously in Sections 1.2 and 5.1, radiological contamination was suspected at LDU CPP-33. Radioactive contaminated soil was encountered during construction activities at the site in 1974 and again in 1983. Although much of the radioactive material was removed during excavation and backfilled, trace amounts of radioactively contaminated soils were reportedly left at the site. A drilling and sampling program to characterize the soils underlying LDU CPP-34 (which contains soil excavated from CPP-33) was conducted in January, 1990 (GAI, 1990). Radiological analysis performed on soil samples from the trench fill at LDU CPP-34 detected low concentrations of radionuclides at several depths in almost all borings. Cesium-137 and strontium-90 were the principal radionuclides detected. Those radionuclides associated with tank farm waste are listed in Table 5-1. This list includes all those radionuclides detected at LDU CPP-34. These wastes would be expected in LDU CPP-33.

During site characterization activities, ambient background radioactivity [which ranged from 200 to 500 counts per minute (cpm)] was periodically monitored by WINCO health physics (HP) personnel. They were equipped with hand-held model 61 Ludlum instrumentation to detect alpha activity and model 2A Ludlum counters to detect beta and gamma. In addition, all samples were scanned to detect subsurface radioactive contamination. Elevated radiation levels were detected in alluvial materials from about 6 to 38 feet BGL, and in the basalt from about 72 to 102 feet BGL. Results are presented in Table 6-4.

TABLE 5-1

POTENTIAL CONSTITUENTS ASSOCIATED WITH THE ICPP TANK FARM AND LDU CPP-33

CONSTITUENT	WASTE DESIGNATION
Acids	
Hydrochloric acid	D002
Nitric acid	D002
Sulfuric acid	D002
Hydrofluoric acid	D002, U134
Metals	
Arsenic	D004
Barium	D005
Cadmium	D006
Chromium	D007
Lead	D008
Mercury	D009
Silver	D011
Organics	
4-Methyl-2-pentanone	U161, F003
Radionuclides	**RADIATION ENERGY TYPE**
Americium 241	Alpha
Antimony 125	Beta, Gamma
Cerium 144	Beta, Gamma
Cesium 134, 137	Beta, Gamma
Cobalt 60	Beta, Gamma
Iodine 129	Beta, Gamma
Neptunium	Alpha, Beta, Gamma
Plutonium 238	Alpha, Beta, Gamma
Ruthenium 103, 106	Beta, Gamma
Strontium 90	Beta
Uranium 234, 235, 236, 238	Alpha
Yttrium 90	Beta

Source: (WINCO 1989c)

6.0 PRE-CLOSURE SAMPLING AND ANALYTICAL RESULTS

6.1 Unit Sampling

To meet the objectives of the sampling program as specified in Section 1.3, four borings were drilled. The first boring was continuously sampled to a depth of 113.6 feet. The second and third borings were drilled to a depth of 13 and 33 feet, respectively. Drilling was halted at these depths due to obstructions encountered. Since the target depth could not be attained, these borings were subsequently grouted. The fourth borehole was drilled to a depth of 29 feet before an obstruction was encountered. Due to these obstructions the third borehole was converted into a lysimeter borehole and the lysimeter installed. The target depth for the lysimeter as specified in the work plan was 40 feet. The borehole location is shown on Figure 6-1. Due to the close proximity of these shallow borings (boring 2-4) to the deep boring, samples were not believed necessary.

Drilling, sampling, and logging of the surficial soils was conducted in accordance with Golder Associates Inc. (GAI) Technical Procedure TP-1.2-5, "Drilling, Sampling, and Logging of Soils." This procedure conforms to, and incorporates those principles and procedures provided by EPA guidance documents (i.e., EPA, 1987a, 8.1.6.1.3 Hollow Stem Augers, 8.1.6.2 Sampling Techniques, 8.1.6.2.1 Split Spoon Samplers, and 8.1.6.2.2 Thin-walled Tube Samplers, EPA, 1986, 3.1 Drilling Methods, and 3.1.1 Hollow-stem Continuous Flight Auger). Soils were identified by the Drilling Project Engineer (DPE) and Lead Project Geologist (LPG) as specified in GAI Technical Procedure TP-1.2-6, "Field identification of Soils" and classified in accordance with U.S. Department of Agriculture (USDA) soil classification procedures included in Table 4-1 of the Quality Assurance Program Plan (QAPP). All samples were handled in accordance with the chain-of-custody procedures specified in GAI Technical Procedure TP-1.2-23.

Hawley Brothers Drilling of Blackfoot, Idaho, was contracted by WINCO to conduct the drilling operations. All work was conducted in accordance with the WINCO Construction Safe Work Permit (CSWP) process. All personnel working at the drill sites wore safety boots, hard hats, and safety glasses. Drilling and sampling activities related to this borehole were conducted from February 8 through March 1, 1991. The borehole log created by the DPE and LPG and a schematic showing the instrumentation placed downhole are presented in Appendix A (and further discussed in Section 14).

All soil and interbed samples were analyzed for the constituents listed below (detailed lists are included in Appendix D):

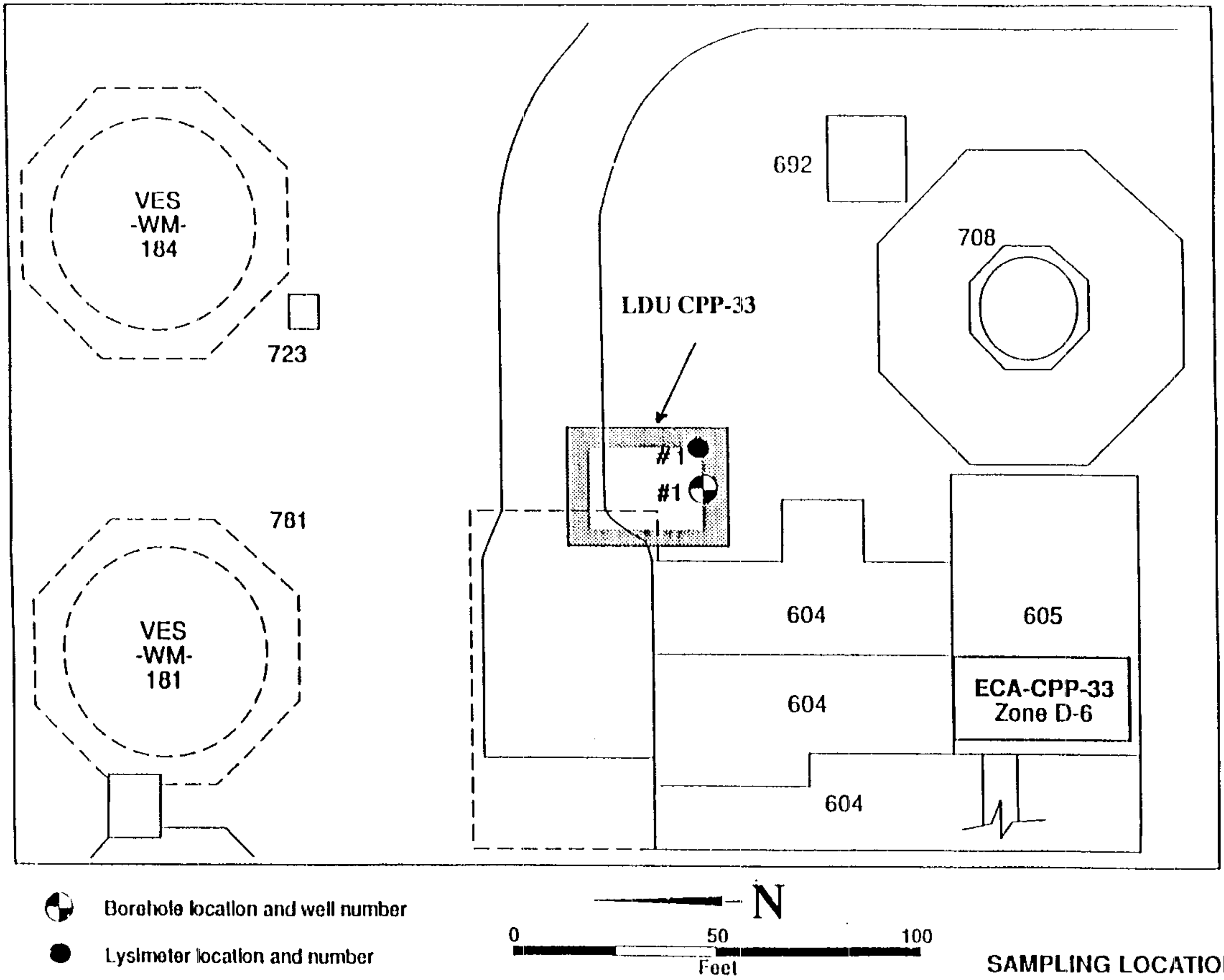
- Volatile Organics,
- RCRA Metals and pH, and
- Radionuclides.

All samples were transferred under chain-of-custody to Controls for Environmental Pollution, Inc. (CEP), Santa Fe, New Mexico.

Depths at which soil samples were analyzed are shown in Table 6-2. Results of the analyses and a discussion of the results is presented in Section 6.5.2, 6.5.3, and 6.5.4.

The drill rig was decontaminated prior to entering the ICPP. Decontamination consisted of high-pressure steam cleaning by the drilling contractor at a WINCO-designated area. GAI personnel visually inspected the drill rig and downhole tools before they were brought on site for grease, hydraulic fluid, and other visible materials that could potentially contaminate the borehole.

All auguring at LDU CPP-33 was conducted using a 6.5-inch-inside-diameter, (9-inch-outside) hollow stem auger. Continuous sampling was conducted ahead of the auger as the hole was advanced in 2-foot increments. A soil sample was collected for chemical analysis, beginning at the surface and for each 2-foot interval, down to a depth of 14 feet BGL. These samples were obtained by driving a 24-inch-long, 4-inch-outside-diameter California split spoon sampler containing a 24-inch clear lexan liner. The sampler was advanced by blows from a rig-mounted, cathead-operated, 140-pound hammer. GAI LPG recorded the number of hammer blows required to drive the split spoon in 6-inch increments. The 2-foot



Borehole location and well number

Lysimeter location and number

FIGURE 6-1
SAMPLING LOCATION LDU CPP-33
EG&G/ICPP-33/ID

PROJECT NO. 893 1105.850 DRAWING NO. 24889 DATE 4/2/91 DRAWN BY TK

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split-spoon sampler, with the soil sample retained inside, was then removed from the borehole for processing.

Beginning at 14 feet BGL and down to the top of the interbed that overlies the basalt (i.e., 42.5 feet BGL), every other 2-foot (approximate) soil sample was targeted for chemical analysis. These samples were obtained as described above, utilizing a split spoon sampler. The intervening 2-foot sample was recovered with a 5-foot split-barrel sampler (i.e., the lower 2 feet of the barrel retained the sample while the overlying 3 feet was unused), fixed to the auger drill string with the shoe of the sampler extending just beyond the cutting edge of the auger bit. In this way, as the borehole was advanced through the underlying 2 feet, a soil sample was recovered within the split barrel, screened for radiological[1] and/or organic[2] contamination along its entire length, logged, and discarded according to WINCO procedures. If the level of radioactivity detected in the soil sample was greater than 100 cpm above background the soil was considered to be contaminated waste and disposed of under the supervision of a WINCO HP by sealing the waste in yellow packaging and placing it in a white "Hot Box." Otherwise, the soil was discarded in a WINCO-approved, plastic-lined, 55-gallon drum. Due to the proximity of the borehole to the CPP stack, background concentrations, ranged from 200-500 cpm depending on stack effluent conditions. For either method of storage and later disposal (based upon analysis results), the containers were labelled, clearly stating where and when the waste was generated. All instrument readings were recorded in the field log book by the LPG and are included in Table 6-4 of this report.

The silty sand soils encountered at 42.5 feet BGL were sampled continuously in 2-foot lengths, down to the underlying basalt (i.e., 48.2 feet BGL). Aliquots from all of these soil samples were prepared for chemical analysis.

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[1]Screening for radiological contamination during field activities was conducted with a hand-held Ludlum model 61 for alpha and model 2A for beta-gamma radiation.

[2]Screening for organic vapors was conducted with a hand-held Century Organic Vapor Analyzer (OVA) model 128 GC.

Preparations were then made to deepen the borehole, requiring the replacement of the auguring assembly with a drill string, fitted to continuously core the underlying basalt. The auger string was left in the open borehole, down to the alluvium-basalt interface, to assure side-wall stability during the coring process. Because the inner diameter (I.D.) of the augers is 6.5 inches and the outer diameter (O.D.) of the HXB drill string is 3.7, the coring assembly can readily be hoisted to the surface to retrieve the sample. Coring continued through the basalt using HXB series wireline core equipment and a HXB series oversize diamond face-discharged pilot-crown bit (which cuts a 2.40 inch diameter core). A double-barrel coring system was used with a lexan inner barrel. The basalt core was retrieved in 5-foot lengths of lexan inner core tube. The core was then capped in the tubes with soft plastic end caps. Drilling in the basalt was conducted in accordance with GAI Technical Procedure TP-1.2-1, "Rock Core Drilling," and cores were logged by the DPE and LPG in accordance with Technical Procedure TP-1.2-2, "Geotechnical Rock Core Logging." The collected rock cores were turned over to WINCO. All samples were handled in accordance with the chain-of-custody procedures specified in TP-1.2-23.

Samples of the clayey material infilling several fractures in the basalt (which caused above background response on the field detection equipment) were submitted to WINCO for radio-chemical analysis. These samples were obtained by scraping and chipping the clayey material that was deposited along fracture surfaces. A description of these samples may be seen in Table 6-4 and results of analysis are discussed in Section 6.5.4. In addition to the fracture fill material, several split spoon samples were collected from the silty clay interbed below 110.3 feet.

All split-spoon samplers, lexan liners, split barrel samplers, drill rod, core barrel, and associated sampling and coring equipment were decontaminated by GAI personnel. Decontamination as specified in Section 5 of the Technical Work Plan included the following procedures:

- steam clean equipment with deionized water and wipe dry;
- wipe with a towel or rag dampened with methanol and allow to air dry; and
- rinse with deionized water and wipe dry, seal in plastic until needed.

Soil and interbed samples for chemical analysis were obtained by driving a split-spoon sampler as described above. Once removed from the borehole the split-spoon sampler was placed on a clean sheet of plastic on a table inside the exclusion zone. The drilling contractor opened the split-spoon and the LPG removed the lexan liner containing the sample. The lexan tube containing the sample was screened with separate alpha and beta-gamma radiation survey instruments along its entire length and on the open ends prior to sealing the tube. All instrument readings were recorded in the field log book by the LPG. The lexan was then capped with soft plastic end caps and the soils logged by the LPG. Once logged, the sample was handed over the drilling exclusion zone barrier for sample preparation in the sample area exclusion zone.

At the preparation area, the sample was prepared by the sample custodian for shipment to the appropriate laboratory.

Samples were processed by laying out a fresh length of protective plastic on the processing table. The caps on each end of the lexan were then removed and 2 inches of sample material was discarded from the upper and lower end of the lexan tube. Grab samples for volatile organics were immediately poured out of the sampling tube into two 8-ounce amber glass jars. The samples were placed into the jars such that little or no headspace was present. The containers were sealed with teflon-lined lids and then labelled.

The remaining sample material was transferred into a decontaminated stainless steel mixing bowl, mixed thoroughly using decontaminated stainless steel utensils, and any material greater than 3 inches discarded. Aliquots of the remaining material were transferred into two separate 8-ounce or one 16-ounce amber glass jar with teflon-lined lids for analyses as follows: pH and RCRA metals and radionuclides. Field duplicate samples were prepared by placing aliquots in appropriate sample containers and labeling them with unique identification numbers.

After labelling, all samples were screened by a WINCO HP to identify those samples with above-background radiation levels. Radioactive samples were separated from non-radioactive samples and placed in designated U.S. Department of Transportation

(DOT) cartons. All samples were held in shipping containers (the radioactive and non-radioactive samples in separate containers) with the necessary amount of coolant for maintaining the samples at 4°C.

All solid wastes generated by the sampling activities for each day were double-packaged according to WINCO waste handling practices and removed from the site for disposal in accordance with INEL waste disposal procedures. Solid wastes suspected of radiological contamination were doubled-bagged and sealed in yellow packaging with the standard magenta radiation symbol. The packaging was labelled showing date, radiation level and site prior to being placed in the white "Hot Boxes." All liquid wastes generated from the final decontamination of sampling equipment were collected in a catch basin and pumped into 55-gallon drums for disposal.

At the end of the sampling activities for each day, non-radioactive samples were double-checked for proper labeling, securely wrapped in bubble pack, and packaged in a cooler with additional blue ice. A chain-of-custody form and security seal was then placed on the cooler. The cooler was transported to Idaho Falls and relinquished to Federal Express to be shipped under chain-of-custody to the appropriate laboratory by overnight service. Due to the more lengthy packaging, labelling, and documentation process associated with shipping radioactive material, radioactive samples were typically stored overnight in a sample shed with security seals applied to the shed door. The following morning, the GAI DPE or LPG and WINCO HP would escort the samples to the Vehicle Monitoring Facility (VMF) shipping department where the samples were surrendered under chain-of-custody to WINCO personnel. The samples were then couried to the appropriate laboratory by overnight service.

6.2 Background Data

Background data for metal concentrations in soils at the ICPP were obtained by the University of Utah Research Institute (UURI) during two studies conducted in 1986 and 1987. Background soils data were obtained at four locations outside the ICPP during an investigation of the Fuel Processing Restoration (FPR) Warehouse Site in 1986. According to the Quality Assurance Sampling Plan (QASP) for this study, background subsurface soils collected were to be geologically identical to soils in the FPR site sampling area. The QASP indicated the FPR site soils were to be sampled at depths of 6 inches below the pre-fill surface of the area and at 18 to 24 inches below the top of the first horizon samples. The actual depth interval sampled for background soils is not noted in the QASP or the final report of the investigation (UURI, 1986a and UURI, 1986b).

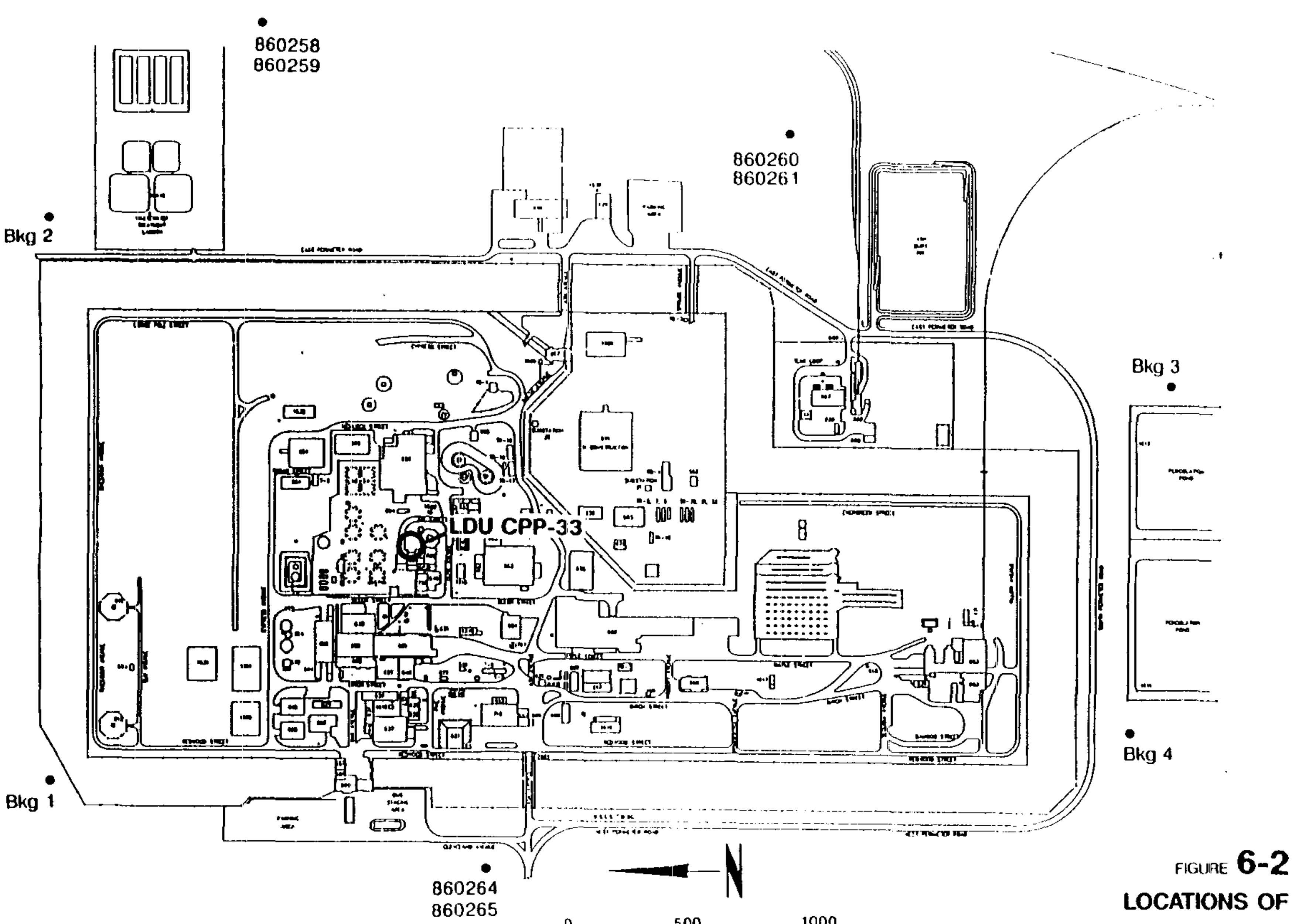
In 1987, background data were obtained at three locations outside the ICPP during an investigation of the Chemical Feed and Zirconium Feed Tank Storage Areas. Samples were obtained at surface to 4 inches and at 24 inches at these locations for a total of six samples (UURI, 1987a and UURI, 1987b).

Locations of background samples from the two studies discussed above are shown in Figure 6-2.

6.2.1 Data Quality Assurance/Quality Control

The precision and accuracy of existing background soils data are discussed in the UURI reports (UURI, 1986b and 1987b), and the data quality objectives established for the sampling are reported to have been met. In general, the quality of the data appears to be sufficient to permit its incorporation into a general ICPP background data base. However the data cannot be completely evaluated. The reports state that appropriate QA/QC was conducted and that records are maintained at the analytical laboratories. Assuming that this evaluation is correct, observations on data quality are summarized below:

- Background soil samples were collected in accordance with standard hand auguring techniques. Laboratory analysis was conducted in accordance with approved EPA methods. These data should be comparable to data collected elsewhere by similar techniques and analyzed by the same EPA methods.



(Sources: UURI 1986a, 1987a)

FIGURE **6-2**
LOCATIONS OF BACKGROUND SOIL SAMPLES
EG&G/CPP-33/ID

PROJECT NO 893-1195.850 DWG NO 23671 DATE 4/11/91 DRAWN HP

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- Based on the information provided in the UURI reports, the precision and accuracy of the laboratory analysis was within the established control limits and was acceptable for the purposes of the original studies.

- The detection limits reported for the analyses are generally higher than can commonly be achieved with standard EPA analytical methods and may not have provided data that are sufficiently precise to satisfy all potential uses.

- Some difficulty was reported for the lead analyses in the warehouse site study (UURI, 1986b), but not in the storage areas study (UURI, 1987b). It is interesting to note that lead was detected in all the background samples collected during the warehouse site study, but was below detection limit in all background samples collected during the storage areas study.

- There was an apparent outlier in the background fluoride data that was not discussed in the UURI, report (UURI, 1987b). The concentration detected in Sample 860264 was 4.0 ppm, while the range of values for all other background samples was 0.12 to 0.42 ppm.

- With the possible exceptions of lead and fluoride, the background inorganic data appears to be adequate for representing the upper 2 feet of soils unimpacted by ICPP activities.

6.2.2 Chemical Parameters

Table 6-1 presents the background data for inorganic constituents obtained during the two investigations conducted by UURI. Both investigations included testing for the eight RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, silver and selenium). In addition, background data for nitrate, fluoride, aluminum, and zirconium was obtained during the investigation of the Chemical Feed Storage and Zirconium Feed Tank Storage Areas.

Analyses were also conducted for volatile organic compounds (EPA Method 8240) and semi-volatile organic compounds (EPA Method 8270) on the four background samples collected during the FPR Warehouse Site investigation (UURI, 1986b). No organic compounds were detected. However, the reported detection limits for the organic compounds (1 to 10 ppm) were higher than commonly achievable (5 to 500 ppb) using the methods referenced. These high detection limits would have the effect of screening out compounds present at low concentrations.

6.2.3 Number of Samples

The number of samples available from existing background data for each of the types of parameters is presented below (see Table 1):

- Volatile Organic Compounds - 4
- Semi-volatile Organic Compounds - 4
- RCRA Metals - 10
- Other (nitrate, fluoride, aluminum, and zirconium) - 6

6.3 QA/QC For LDU CPP-33 Sampling

QA/QC procedures were implemented during the sampling and analysis program at LDU CPP-33. These procedures are summarized below:

- Seven field blank samples (six trip blanks and one equipment blank) were collected and analyzed to monitor potential contamination that may have been introduced from the decontamination procedures and shipping process.

TABLE 6-1

BACKGROUND CONCENTRATIONS OF METALS AND FLUORIDE
IN SOILS SAMPLED FROM OUTSIDE THE ICPP FACILITY AND
ONE-SIDED NORMAL TOLERANCE INTERVALS(1)

Results in PPM									
Sample	Arsenic	Barium	Cadmium	Chromium	Lead (2)	Mercury	Selenium	Silver	Fluoride
Bkg 1	5.6	200	<5	25	12	0.043	0.484	<2	
Bkg 2	5.1	270	<5	32	16	0.019	0.405	<2	
Bkg 3	6.5	270	<5	33	17	0.027	0.467	<2	
Bkg 4	7	250	<5	34	12	0.028	0.341	<2	
258	5.6	280	<5	28	<10	0.025	0.113	<2	0.15
259	7.6	380	<5	26	<10	0.057	0.252	<2	0.32
260	6.4	240	<5	28	<10	0.023	0.695	<2	0.12
261	6.2	220	<5	18	<10	0.03	0.236	<2	0.42
264	6	230	<5	28	<10	0.021	0.102	<2	4.00
265	7.6	210	<5	20	<10	0.046	0.227	<2	0.28
Average (x) Std. Dev. (SD) Background UTL (3)	6.4 0.8 8.7	255 51 403	<5 -- --	27 5 42	9 5 24	0.032 0.013 0.070	0.332 0.184 0.868	<2 -- --	0.88 1.53 6.55

1. All samples were collected by the University of Utah Research Institute, Salt Lake City, UT using EPA methods. Samples Bkg 1-4 were collected for the FPR Warehouse Site, and 258-265 were collected for the Chemical Storage and Zirconium Feed Tank Storage Areas. All analyses are total constituent analyses and are reported on a dry weight basis.

2. Where lead values are listed below detection limit a value of one-half the detection limit was used in the calculation of the average, standard deviation and tolerance limit values.

3. The background one-sided upper tolerance interval (UTL) is (x) + K*SD, where the K value (tolerance factor) for sample size n = 10 is equal to 2.911 with a probability level y = 0.95 and coverage P = 95%

- A field duplicate sample was collected to measure overall precision (i.e., field and laboratory).

Quality control samples represented 31 percent of the total number of samples collected.

6.3.1 Blanks

Trip blanks were included in each sample shipment container in which volatile organic samples were shipped as a means of detecting the introduction of contaminants to the samples through sample handling, storage, preparation and analysis. The equipment blank sample was submitted as a means of detecting the introduction of contamination to the samples from inadequate equipment decontamination or from sample handling and preparation procedures. The equipment blank was prepared by decontaminating the sample processing equipment as described in Section 9 of the Technical Work Plan, Volume II (GAI, 1991b), followed by a final rinse with deionized water and collected in proper containers. Laboratory method blanks were prepared and analyzed with the samples as a means of detecting the introduction of contaminants into the samples as a result of laboratory procedures. As recommended by the EPA (EPA, 1988a and EPA, 1988b), sample results that are less than or equal to 5 times (10 times for the common laboratory contaminants) the concentration of the compound or analyte in an associated blank are qualified as undetected (U) at the reported concentration during data validation.

6.3.1.1 Volatile Organic Analysis Blanks

Trip blanks were submitted for volatile organic analysis in all sample shuttles. Methylene chloride was detected in three of the six trip blanks (0.5 to 1 ug/L) submitted as well five of the seven laboratory blanks (0.7 to 3 ug/L). The presence of methylene chloride in the laboratory blanks suggests the source of the compound is most likely the laboratory. All sample results were less than 10 times the concentration in the laboratory blanks; therefore, the sample results were requalified as undetected (U) at the concentration reported.

Acetone was detected in all samples analyzed including all six trip blanks (ranging from 4 to 11 ug/L), the equipment blank (48 ug/L), and all seven laboratory blanks (5 to 7 ug/L). The presence of acetone in the laboratory blanks points to the laboratory as the source of the acetone. All sample results were less than 10 times the concentration in the laboratory, trip, or equipment blanks; therefore, the sample results were requalified as undetected (U) at the concentration reported.

2-butanone was detected in the equipment blank at 7 ug/L. Because 2-butanone is a common laboratory contaminant and is not used in the decontamination procedures, the contaminant was most likely introduced to the sample during the laboratory sample processing. 2-butanone was not detected in any other samples.

Four Tentatively Identified Compounds (TICs) were reported for most samples and blanks. Because the TICs were detected in the method blanks, these compounds were most likely introduced into the samples in the laboratory. All sample results were less than 5 times the concentration found in the method blanks; therefore, the sample results were requalified as undetected at the concentration reported.

6.3.1.2 Metals Analysis Blanks

The equipment blank sample was submitted for metals analyses. Lead was the only analyte detected above the instrument detection limit in the equipment blank. All sample concentrations of lead were greater than 5 times the concentration found in the equipment blank, therefore, qualification of the sample results due to blank contamination was not required.

6.3.1.3 Radionuclide Analysis Blanks

The equipment blank sample was submitted for radionuclide analysis. Strontium-90 was detected in the equipment lank at a concentration of 3.0 $\pm$2.1 pCi/L. All sample concentrations of strontium-90 above the detection limit were greater than 5 times the concentration found in the equipment blank, therefore, qualification of the sample results due to blank contamination was not required.

6.3.2 Field Duplicate Sample

The field duplicate sample analysis results from CPP-33 Site 1 (Borehole 1) are presented in Table C-1 (Appendix C). The sample was collected and prepared as described in Section 6.1 and submitted for volatile organic, pH, and RCRA metals analysis. The table presents the relative percent difference (RPD, as defined in EPA 1988b) between duplicate samples for analyses that exhibit concentrations greater than the sample detection limit. Although no criterion has been established for field duplicates, the EPA advises that the RPD fall within a range of $\pm$20 percent for water samples and $\pm$35 percent for soils when sample values are greater than five times the sample detection limit. All field duplicate results were within the advisory control limit range except for cesium-137.

6.3.3 Field Split Samples

Collection of field split samples was not scheduled for this sampling event. However, due to miscommunication with the laboratory, samples numbered CPP33-01-TX-1-1, CPP33-01-TX-3-2, CPP-33-01-R-1-1 and CPP33-01-R-3-2 were analyzed as split samples. (Two sample containers of each sample were submitted to ensure sufficient sample, but the laboratory analyzed each container as a separate sample.) Sample results for the inorganic analysis are included in Table C-2 (Appendix C) with the calculated Relative Percent Difference (RPD). Radionuclide analysis results for field split samples have not been included as all radionuclides were below detection. No criterion has been established for field split samples, although advisory control limits of +20 for water samples and ±35% for soils is often used. Analysis data is not qualified on the basis of field split samples.

6.4 Data Validation

All samples were analyzed following CLP protocols (EPA, 1988c and EPA, 1988d). Sample analysis results were reviewed and validated in accordance with Section 8 of the Technical Work Plan, Volume II - quality Assurance Project Plan (GAI, 1991b) and with the EPA data validation guidelines (EPA, 1988a and EPA, 1988b). Data assessment summaries are included in the appendices with the laboratory submitted Form I's.

Holding times for soil samples have not yet been established, however, all soil samples were analyzed within the recognized advisory holding times specific to the extraction or analyses (i.e., 14 days for volatile organics, 28 days for mercury, etc.).

Trichloroethene was the only volatile organcic compound detected in the soil samples that was not requalifed as undetected due to blank contamination. Trichloroethene was detected in only one sample (collected at the seven foot interval), however, the concentration was below the contract required quantitation limit and therefore the sample result is qualified as estimated, "J".

Because the laboratory did not have access to a solid matrix laboratory control sample (LCS), all metals analysis results were qualified as estimates (J or UJ).

6.5 Data Evaluation

6.5.1 Background Data

The background data obtained from the UURI investigations is compared with CPP-33 results in Table 6-2. This table includes the one-sided upper tolerance limit (UTL) for the background data assuming a normal distribution with 95 percent coverage of the samples at a 95 percent confidence coefficient. Tolerance limits establish a concentration range that is constructed to contain a specified proportion of coverage, P%, of the population with a specified confidence coefficient, Y (EPA, 1989a).

There are potential limitations that should be considered in the use of the data obtained by UURI for determining action levels based on background concentrations. These limitations include the following:

- All UURI background data were obtained in the shallow surface soils (0 to 24 inches) and may not be representative of other soil types or horizons;

- LDU CPP-33 has been excavated and filled; consequently, background soils sampled by UURI may not be representative of soils used for fill at the LDU CPP-33; and

- There may be widespread elevated concentrations of certain constituents above natural background at the ICPP from both point and non-point sources as a result of site activities. It is not appropriate to establish action levels for LDUs based on natural background if there are widespread elevated concentrations of constituents at the ICPP unrelated to releases from the LDUs.

TABLE 6-2

INORGANIC SAMPLE ANALYSIS RESULTS
LAND DISPOSAL UNIT CPP-33, BOREHOLE 1
(Results in mg/Kg, except pH in SU)

Depth (ft)	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	pH
1	3.7 J	74.8 J	3.8 J	16.4 J	9.6 J	1.51 J	1.0 UJ	0.83 J	10.20
3	3.2 J	81.5 J	3.9 J	16.8 J	10.6 J	0.27 J	1.0 UJ	0.73 J	10.10
5	3.0 J	58.1 J	2.7 J	11.3 J	7.4 J	0.08 J	1.1 UJ	0.63 J	10.20
7	2.8 J	66.1 J	3.2 J	13.4 J	9.7 JJ	0.16 J	1.1 UJ	0.54 J	9.54
9	4.7 J	75.8 J	4.1 J	15.6 J	11.7 J	0.12 J	1.1 UJ	0.54 J	11.50
11	3.3 J	61.1 J	3.3 J	11.9 J	8.7 J	0.24 J	1.1 UJ	0.53 J	9.40
17	4.1 J	81.9 J	4.8 J	15.7 J	12.0 J	0.09 J	1.0 UJ	0.52 J	9.47
21	4.6 J	82.7 J	5.1 J	17.7 J	11.4 J	0.14 J	1.1 UJ	0.54 J	9.09
25	3.9 J	88.8 J	5.0 J	16.3 J	12.2 J	0.12 J	1.1 UJ	0.53 J	9.30
29	4.3 J	91.0 J	4.6 J	15.8 J	12.2 J	0.19 J	1.1 UJ	0.65 J	9.36
33	4.3 J	57.6 J	2.7 J	10.1 J	6.9 J	0.15 J	1.1 UJ	0.54 J	9.41
37	5.5 J	61.1 J	4.6 J	13.3 J	9.6 J	0.17 J	1.1 UJ	0.64 J	9.58
39	5.5 J	144.0 J	8.2 J	31.8 J	19.5 J	0.12 J	1.2 UJ	0.72 J	9.38
41	4.8 J	158.0 J	9.4 J	36.9 J	22.8 J	0.26 J	1.1 UJ	1.15 J	8.87
45	4.9 J	193.0 J	11.1 J	40.0 J	25.5 J	0.13 J	1.2 UJ	0.71 J	9.30
47	4.2 J	178.0 J	9.1 J	34.1 J	21.1 J	0.05 J	1.2 UJ	0.59 J	9.08
112	5.9 J	193.0 J	11.2 J	34.0 J	31.7 J	0.03 J	0.51 J	0.92 J	9.53
113	6.8 J	191.0 J	11.1 J	37.0 J	30.5 J	0.02 J	0.78 J	0.92 J	9.73
CRQL	2.0	40.0	1.0	2.0	1.0	0.10	1.0	2.0	NA
Backgro und UTL	8.7	403.0	5.0	42.0	24.0	0.07	0.9	2.0	NA

CRQL - Contract Required Quantitation Limit
U - Analyte was undetected at the concentration reported

TABLE 6-3

DETECTED ORGANIC COMPOUNDS
LAND DISPOSAL UNIT CPP-33, BOREHOLE 1
(Results in μg/kg)

SAMPLE NO.	TRICHLOROETHENE
CPP33-01-7-4	1 J

TABLE 6-4

RESULTS OF FIELD SCREENING BY WINCO HP AT BOREHOLE CPP-33-1

Depth Below Ground Level (feet)	Radiation Surveyed from Soils/Core Removed from Borehole (cpm)	Media
0.0 - 2.0	Background[1]	Alluvium
2.0 - 4.0	Background[1]	Alluvium
4.0 - 6.0	Background[1]	Alluvium
6.0 - 8.0	1,800	Alluvium
8.0 - 10.0	2,400	Alluvium
10.0 - 12.0	2,000	Alluvium
16.0 - 18.0	10,000	Alluvium
20.0 - 22.0	4,000	Alluvium
24.-0 - 26.0	4,000	Alluvium
28.0 - 30.0	2,500	Alluvium
32.0 - 34.0	Background[1]	Alluvium
36.0 - 38.0	6,000	Alluvium
38.0 - 40.0	Background[1]	Alluvium
40.0 - 42.0	Background[1]	Alluvium
44.0 - 46.0	Background[1]	Alluvium
46.5 - 47.8	Background[1]	Alluvium
48.2 - 52.6	Background[1]	Clayey fracture infill[2]
52.6 - 57.6	Background[1]	Clayey fracture infill[2]
57.6 - 62.7	Background[1]	Basalt[3]

NOTE: All readings are maximum values. WINCO HPs surveyed soils and cores with a Ludlum beta/gamma detector.

cpm = counts-per-minute

[1] Ambient background radioactivity in the vicinity of CPP-33 ranged from 200 to 500 cpm.
[2] The measurement was taken along clayey material lining surfaces in basalt.
[3] Fractures in basalt were not clay lined.

TABLE 6-4 (Continued)

RESULTS OF FIELD SCREENING BY WINCO HP AT BOREHOLE CPP-33-1

Depth Below Ground Level (feet)	Radiation Surveyed from Soils/Core Removed from Borehole (cpm)	Media
62.7 - 67.7	Background[1]	Clayey fracture infill[2]
67.7 - 72.7	Background[1]	Basalt[3]
72.7 - 74.0	1,000	Clayey fracture infill[2]
74.0 - 74.9	900	Clayey fracture infill[2]
74.9 - 79.0	10,000	Clayey fracture infill[2]
79.0 - 84.0	20,000	Clayey fracture infill[2]
84.0 - 89.0	40,000	Clayey fracture infill[2]
89.0 - 91.0	32,000	Clayey fracture infill[2]
91.0 - 94.0	10,000	Clayey fracture infill[2]
95.0 - 99.0	15,000	Clayey fracture infill[2]
99.0 - 102.4	16,000	Clayey fracture infill[2]
102.4 - 107.2	Background[1]	Clayey fracture infill[2]
107.2 - 110.3	Background[1]	Interbed
110.3 - 112.3	Background[1]	Interbed
112.3 - 113.6	Background[1]	Interbed

NOTE: All readings are maximum values. WINCO HPs surveyed soils and cores with a Ludlum beta/gamma detector.

cpm = counts-per-minute

[1] Ambient background radioactivity in the vicinity of CPP-33 ranged from 200 to 500 cpm.
[2] The measurement was taken along clayey material lining surfaces in basalt.
[3] Fractures in basalt were not clay lined.

6.5.2 Results of RCRA Metals and pH Analysis for LDU CPP-33

Sample results for the Inorganic Analysis, as reported by the laboratory, are included in Appendix E.

Validated sample results for the RCRA metals are shown in Table 6-2. Also shown on this table is the upper tolerance limit (UTL) for each analyte for the background soils described in Section 6.2. Cadmium, lead and mercury were the only metals found exceeding the background UTL.

Cadmium was detected above the background UTL in the five deepest samples: 41 feet, 8.2 mg/Kg; 45 feet, 9.3 mg/Kg. Lead was detected above the background UTL in one sample (24.1 mg/Kg) at 112-foot depth. However, as noted previously, existing background data may not be representative at these depths. Mercury was detected above the background UTL in all samples except the three depest. Mercury was detected at 1.45 mg/Kg in the sample collected at the 1-foot depth, but all other samples for which mercury ws above the background UTL were 0.26 mg/Kg or less.

6.5.3 Result of Organic Analysis for LDU CPP-33

Sample results for the Volatile Organic Analysis, as reported by the laboratory, are included in Appendix F.

The only positively identified organic constituent detected in the validated organic results was trichloroethene. Trichloroethene was detected in the sample collected at the 7-foot depth only, and at a level (1 ug/Kg) below the contract required quantitation limit for soils (5 ug/Kg). Therefore, only an estimated (J) concentration appears in Table 6-3.

6.5.4 Results of Radionuclide Analysis

Validated sample results for the radionuclide analysis are presented in Table 6-5. Laboratory reported results are included in Appendix E, following the Inorganic Analysis Data Sheets. Results of field screening are presented in Table 6-4.

As seen in Table 6-5 americium, cesium, neptunium, plutonium, strontium, and uranium were detected in the samples submitted for radiochemical analysis. Americium-241 was detected in the samples submitted for activity of 9.59 pCi/g down to a depth of 11 feet BGL an is not detected again until the 45-foot sample (0.39 pCi/g). Neptunium-237 is first detected at a depth of 37 feet BGL (1.14 pCi/g), then at the 41-foot depth (0.68 pCi/g) and again in the 112-foot sample (0.38 pCi/g). It was not detected in the lowermost 113-foot sample. Plutonium-239 and -240 were only detected in the surficial sample (0.34 pCi/g). Plutonium-238 was seen to persist down to a depth of 11 feet below surface. (A maximum concentration of 0.46 pCi/g was reported). Although detected at low levels of activity, uranium-234 and -238 was present in all but one of the borehole samples submitted for anlaysis. The range in activity values for uranium-234 was from 0.09 to 0.51 pCi/g, with the maximum value detected at a depth of 47 feet BGL. An activity of 0.07 pCi/g was detected in the 113-foot sample. The pattern of occurrence of uranium-238 was seen to be very similar to that of uranium-234. The concentrations detected for a given sample generally differed by a few hundredths pCi/g.

Cesium-137 and strontium-90 were detected at levels significantly higher than the other targeted radionuclides (see Table 6-5). Within the alluvial material, the pattern of occurrence of these two radionuclides is similar with depth. Relatively low levels of strontium and cesium (non-detect to less than 3 pCi/g) were detected fromt he surface down to a depth of approximately 5 feet. Concentrations increase with depth and a maximum value for strontium and cesium ws detected at depths of 17 feet (328,8 $\pm$ 1.8 pCi/g) and 25 feet (606 $\pm$ 3 pCi/g), respectively. Concentrations of both radionuclides fall off rapidly at depths greather than 37 feet BGL. At the sediment-basalt interface (approximtely 47 feet BGL), strontium-90 was not detected at the Sample Quantitation Limit (SQL); however, cesium-137 ws detected at an activity level of 2.13 $\pm$ 0.07 pCi/g.

Cesium is strongly partitioned to the solid phase. This characteristic is expressed by the distribution coefficient, K_d, which is the ratio of the mass of solute sorbed by the solid pahse (mg/Kg) to the mass of solute dissolved in water (mg/L), under assumptions of equilibrium. The distribution coefficient for cesium-137 is estimated to be 20 to 60 times higher than that of strontium-90 in the same system (Robertson, 1977). A K_d for strontium-90 equal to 60 was obtained by measuring the concentration of strontium-90 present in water and soil samples from a borehole and well in the vicinity of the ICPP. The results of laboratory batch tests show the K_d for strontium-90 to vary from 45 to 50 (Thomas, telcon, February, 1991). Therefore, cesium-137 migration is very slow and much slower and generally at lower concentrations than strontium-90.

It must be emphasized, however, because the contaminated soils encountered during the excavations of 1974 and 1983 have been removed and replaced by fill material, ther exist a number of scenarios which can account for the pattern of radionuclides detected beneath LDU CPP-33.

TABLE 6-5

RADIONUCLIDE SAMPLE RESULTS
LAND DISPOSAL UNIT CPP-33, BOREHOLE 1
(Results in pCi/g)

SAMPLE NO. CPP33-01-	DEPTH (FT)	AMERICIUM -241	ANTIMONY -125	CERIUM -144	CESIUM -134	CESIUM -137	COBALT -58
R-1-1	1	2.04 ± 0.87	0.03 U	0.05 U	0.08 U	0.03 U	0.09 U
R-3-2	3	0.05 U	0.03 U	0.05 U	0.08 U	0.40 U	0.09 U
TX/R-5-3	5	2.91 ± 2.02	0.03 U	0.05 U	0.08 U	0.40 U	0.09 U
TX/R-7-4	7	0.05 U	0.03 U	0.05 U	0.08 U	306 ± 4	0.09 U
TX/R-9-5	9	0.05 U	0.03 U	0.05 U	0.08 U	254 ± 3	0.09 U
TX/R-11-6	11	9.59 ± 1.59	0.03 U	0.05 U	0.08 U	53.0 ± 1.8	0.09 U
TX/R-17-7	17	0.05 U	0.03 U	0.05 U	0.08 U	219 ± 3	0.09 U
TX/R-21-8	21	0.05 U	0.03 U	0.05 U	0.08 U	416 ± 4	0.09 U
TX/R-25-9	25	0.05 U	0.03 U	0.05 U	0.08 U	606 ± 3	0.09 U
TX/R-29-10	29	0.05 U	0.03 U	0.05 U	0.08 U	298 ± 2	0.09 U
TX/R-33-11	33	0.05 U	0.03 U	0.05 U	0.08 U	10.3 ± 0.4	0.09 U
TX/R-37-12	37	0.05 U	0.03 U	0.05 U	0.08 U	121 ± 1	0.09 U
TX/R-39-13	39	0.05 U	0.03 U	0.05 U	0.08 U	0.42 ± 0.07	0.09 U
TX/R-41-14	41	0.05 U	0.03 U	0.05 U	0.08 U	0.12 ± 0.07	0.09 U
TX/R-45-15	45	0.39 ± 0.24	0.03 U	0.05 U	0.08 U	2.37 ± 0.15	0.09 U
TX/R-47-16	47	0.05 U	0.03 U	0.05 U	0.08 U	2.13 ± 0.07	0.09 U
112	112	0.05 U	0.03 U	0.05 U	0.08 U	0.04 U	0.09 U
113	113	0.05 U	0.03 U	0.05 U	0.08 U	0.08 U	0.09 U

U - Radionuclide undetected at the reported concentration.

TABLE 6-5 (Cont.)

RADIONUCLIDE SAMPLE RESULTS
LAND DISPOSAL UNIT CPP-33, BOREHOLE 1
(Results in pCi/g)

SAMPLE NO. CPP33-01-	DEPTH (FT)	COBALT -60	IODINE -129	NEPTUNIUM -237	PLUTONIUM -239/240	PLUTONIUM -238	RUTHENIUM -103
1-1	1	0.07 U	0.5 U	0.4 U	0.34 ± 0.12	0.46 ± 0.14	0.2 U
3-2	3	0.07 U	0.5 U	0.5 U	0.05 U	0.05 U	0.2 U
TX/R-5-3	5	0.07 U	0.5 U	0.5 U	0.05 U	0.06 ± 0.04	0.2 U
TX/R-7-4	7	0.07 U	0.5 U	0.5 U	0.05 U	0.05 U	0.2 U
TX/R-9-5	9	0.07 U	0.5 U	0.5 U	0.05 U	0.08 ± 0.05	0.2 U
TX/R-11-6	11	0.07 U	0.5 U	0.5 U	0.05 U	0.05 U	0.2 U
TX/R-17-7	17	0.07 U	0.5 U	0.5 U	0.05 U	0.05 U	0.2 U
TX/R-21-8	21	0.07 U	0.5 U	0.5 U	0.05 U	0.05 U	0.2 U
TX/R-25-9	25	0.07 U	0.8 U	0.5 U	0.05 U	0.05 U	0.2 U
TX/R-29-10	29	0.07 U	0.7 U	0.5 U	0.05 U	0.05 U	0.2 U
TX/R-33-11	33	0.07 U	0.8 U	0.5 U	0.05 U	0.05 U	0.2 U
TX/R-37-12	37	0.07 U	0.2 U	1.14 ± 0.60	0.05 U	0.05 U	0.2 U
TX/R-39-13	39	0.07 U	0.3 U	0.5 U	0.05 U	0.05 U	0.2 U
TX/R-41-14	41	0.07 U	0.8 U	0.68 ± 0.27	0.05 U	0.05 U	0.2 U
TX/R-45-15	45	0.07 U	0.9 U	0.6 U	0.05 U	0.05 U	0.2 U
TX/R-47-16	47	0.07 U	0.3 U	0.3 U	0.05 U	0.05 U	0.2 U
112	112	0.07 U	0.1 U	0.38 ± 0.17	0.05 U	0.05 U	0.2 U
113	113	0.07 U	0.1 U	0.4 U	0.05 U	0.05 U	0.2 U

U - Radionuclide undetected at the reported concentration.

TABLE 6-5 (Cont.)

RADIONUCLIDE SAMPLE RESULTS
LAND DISPOSAL UNIT CPP-33, BOREHOLE 1
(Results in pCi/g)

SAMPLE NO. CPP33-01-	DEPTH (FT)	RUTHENIUM -106	STRONTIUM -90	URANIUM -234	URANIUM -235	URANIUM -238
1-1	1	0.07 U	2.87 ± 0.20	0.09 ± 0.02	0.05 U	0.09 ± 0.03
3-2	3	0.07 U	0.35 ± 0.10	0.15 ± 0.05	0.05 U	0.13 ± 0.04
TX/R-5-3	5	0.07 U	1.63 ± 0.15	0.10 ± 0.02	0.05 U	0.10 ± 0.02
TX/R-7-4	7	0.07 U	102.0 ± 1.1	0.12 ± 0.03	0.05 U	0.09 ± 0.03
TX/R-9-5	9	0.07 U	281.7 ± 1.8	0.12 ± 0.03	0.05 U	0.09 ± 0.02
TX/R-11-6	11	0.07 U	47.68 ± 0.74	0.08 ± 0.03	0.05 U	0.08 ± 0.03
TX/R-17-7	17	0.07 U	328.8 ± 1.8	0.10 ± 0.03	0.05 U	0.13 ± 0.04
TX/R-21-8	21	0.07 U	294.7 ± 1.7	0.16 ± 0.04	0.05 U	0.10 ± 0.03
TX/R-25-9	25	0.07 U	163.5 ± 1.3	0.13 ± 0.02	0.05 U	0.11 ± 0.02
TX/R-29-10	29	0.07 U	108.4 ± 1.1	0.12 ± 0.04	0.05 U	0.13 ± 0.04
TX/R-33-11	33	0.07 U	6.0 ± 0.3	0.18 ± 0.04	0.05 U	0.26 ± 0.04
TX/R-37-12	37	0.07 U	47.9 ± 0.7	0.05 U	0.05 U	0.05 U
TX/R-39-13	39	0.07 U	0.87 ± 0.12	0.28 ± 0.09	0.05 U	0.30 ± 0.09
TX/R-41-14	41	0.07 U	0.39 ± 0.11	0.32 ± 0.04	0.05 U	0.54 ± 0.05
TX/R-45-15	45	0.07 U	2.5 ± 0.2	0.17 ± 0.03	0.05 U	0.18 ± 0.04
TX/R-47-16	47	0.07 U	0.10 U	0.51 ± 0.19	0.05 U	0.53 ± 0.20
112	112	0.07 U	0.16 ± 0.08	0.07 ± 0.01	0.05 U	0.05 ± 0.01
113	113	0.07 U	0.18 ± 0.08	0.20 ± 0.02	0.05 U	0.19 ± 0.02

U - Radionuclide undetected at the reported concentration.

7.0 CLOSURE PROCEDURES

Remediation of CPP-33 is to be based on the presence of hazardous waste or concentrations of hazardous constituents and the level of risk posed to human health and safety or the environment. The action level requiring RCRA closure of LDU CPP-33 is to be based on the pH of the soils and/or the presence of metals or organics above the TCLP limits. The action level associated with pH is less than or equal to 2 or greater than or equal to 12.5. Additional action levels of other hazardous constituents is to be based on an unacceptable risk to human health and safety.

Though several inorganic constituents were detected above background levels, none were found exceeding the maximum allowable soil concentrations based on the Chronic Reference Dose (see Table G-2). The Chronic Reference Dose is the daily intake of the constituent at which even a sensitive individual might be exposed without developing associated critical toxic effects. Furthermore, none of the constituents exceeded the allowable soil concentrations proposed in the Corrective Action for Solid Waste Management Facilities (Fed. Reg. Vol. 55, No. 145 30798-30884). The pH analytical results from the borehole soil samples were all below the pH-based action levels.

The Health and Environmental Assessment of CPP-33 (Golder Associates, 1991d) is contained in Appendix G.

Although radionuclides are not governed by RCRA, radiological analyses and a health and environmental assessment were performed to determine if the radiological contamination present at the unit posed a risk to human health, safety, or the environment. The radionuclides detected do not pose an unacceptable risk. The upcoming FFA/CO may require additional characterization, risk assessment and remediation.

Since RCRA hazardous wastes/constituents were detected at levels below those that would pose a threat to human health and safety or the environment, no basis exists for remediation or post-closure of this site in accordance with RCRA. Therefore, LDU CPP-33 should be clean closed under RCRA.

8.0 POST-REMOVAL SAMPLING AND ANALYTICAL PROCEDURES

Since LDU CPP-33 will be clean closed, post-removal verification will not be conducted under RCRA. Post-removal verification will be addressed under the upcoming INEL Federal Facilities Agreement if site remediation is required.

Post-removal sampling and chemical analysis would be conducted consistent with the protocol and procedures in the Technical Work Plan and Quality Assurance Project Plan for CPP-33 (GAI 1991a and 1991b). If additional soil in the vicinity of the LDU CPP-33 is removed at a later date, in accordance with the FFA/CO, post-removal sampling and analysis will be conducted at that time.

9.0 CLOSURE QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

All sampling and analysis activities were performed in accordance with sound QA/QC procedures. These procedures are outlined in the QAPP for drilling and Sampling Activities at the ICPP Tank Farm (Golder Associates 1991a). The plan incorporates all applicable requirements of ANSI/ASME NQA-1, Quality Assurance Program Requirements for Nuclear Facilities, which is defined as the preferred standard for all projects conducted at nuclear facilities by U.S. Department of Energy (DOE) Order 5700.6B, Quality Assurance. In addition, the QAPP was written in compliance with the guidelines provided by Interim Guidelines for Preparation of Quality Assurance Project Plans (QAMS/005). Interpretations of QAMS/005 and expanded guidance provided by other applicable EPA guidance documents were considered during the preparation of the QAPP.

10.0 CLOSURE CERTIFICATION

If LDU CPP-33 is clean closed and no soil is removed, a *closure* certification will not be required. If remediation is required, under the FFA/CO this Closure Plan and all associated activities will be reviewed by a registered engineer. Upon completion, a certification will be obtained stating that all work was performed in accordance with the closure plan.

11.0 AREA RESTORATION

Since no remedial activities will be conducted under RCRA, area restoration will not be required. Area restoration will be addressed under the upcoming INEL Federal Facilities Agreement if site remediation is required.

12.0 OTHER TOPICS OF CONCERN

None at this time.

13.0 POST-CLOSURE CARE

Since the unit is being clean closed, post-closure requirements under RCRA (40 CFR 265.117 - 120) and the COCA will not be required.

Additionally, monitoring to support characterization of the Tank Farm will be conducted. The lysimeter and monitoring well, installed at LDU CPP-33 (their location is shown in Figure 6-1, and construction details are shown in Appendix A), will provide water samples allowing surveillance of dissolved constituents.

14.0 REFERENCES

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